

ENCLOSURE (B) 11

INVESTIGATIONS ON THE TREATMENT  
OF LIGNITE TAR

by

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SUMMARY

By laboratory experiments it was confirmed that by using a simple batch retort, a naval bunker fuel of satisfactory quality could be distilled from lignite crude tar, the yield being 60 - 65%.

I. INTRODUCTION

It is possible to manufacture about 2% of tar oil from lignite by carbonizing at a temperature of 400 - 450°C, for 20 - 25 hours. However, it is impossible to use this tar in naval boilers because its melting point is too high. The problem of obtaining a satisfactory boiler fuel from this tar was assigned as an urgent problem, and the work was carried out very hurriedly by Nav. Eng. Lieut., I. TANAHASHI, S. HIRANO, Nav. Eng., Y. FUJIEDA, during the period May - August, 1945.

II. DETAILED DESCRIPTIONA. Test Apparatus

A simple batch retort with a goose-neck was designed; the details of which are shown in Figure 1(B)11.

B. Test Procedures

About 10kg of crude tar oil were charged (60% of the retort volume) and heated slowly to 200°C during a period of about two hours to avoid foaming of oil. Next, the oil was rapidly heated to the peak temperature of 340°C, over a period of 4 hours. During this period the product oil was almost completely distilled over, and during a subsequent period of 2 hours, coking occurred at moderate heating rate.

C. Experimental Results

A material balance for the overall operation is given by Figure 2(B)11. All yields are weight per cent.

Physical and chemical properties of the products and raw materials are given in Table I(B)11. The raw lignite tar was obtained from Aichi Prefecture.

It was possible to remove 95% of the water included in the crude lignite tar by warming to a temperature of 60 - 80°C.

It was possible to distill the dehydrated tar satisfactorily to coke in the goose-necked retort by regulating the heating velocity in the initial period to avoid foaming.

Corrosion tests with various metals showed that the heavy oil was only very slightly corrosive to steel, iron, copper, and brass.

III. CONCLUSIONS

It was concluded that it was possible to manufacture a fuel oil from the lignite tar oil, which was satisfactory for use in naval boilers.

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Table I(B)11  
PHYSICAL AND CHEMICAL PROPERTIES OF PRODUCTS AND RAW MATERIALS

	Naval Boiler Fuel Specification	Raw Light Tar	Heavy Oil Distillate Product
Sp. Gr. (15/4°C)		0.9010	0.9137
Viscosity (R-I, 30°C sec)	below 2000 sess (R-2, 0°C)	97.0	44.0
Flash pt. (°C)	over 80	87.0	75.0
Pour pt. (°C)		24.0	4.0
Conradson's Carbon (%)		7.51	0.45
Calorific Value (Cals)	over 10,000	10,400	10,700
Impurity (%)	none	0.07	trace
Water Content (%)	below 1.0	26.0	0.9

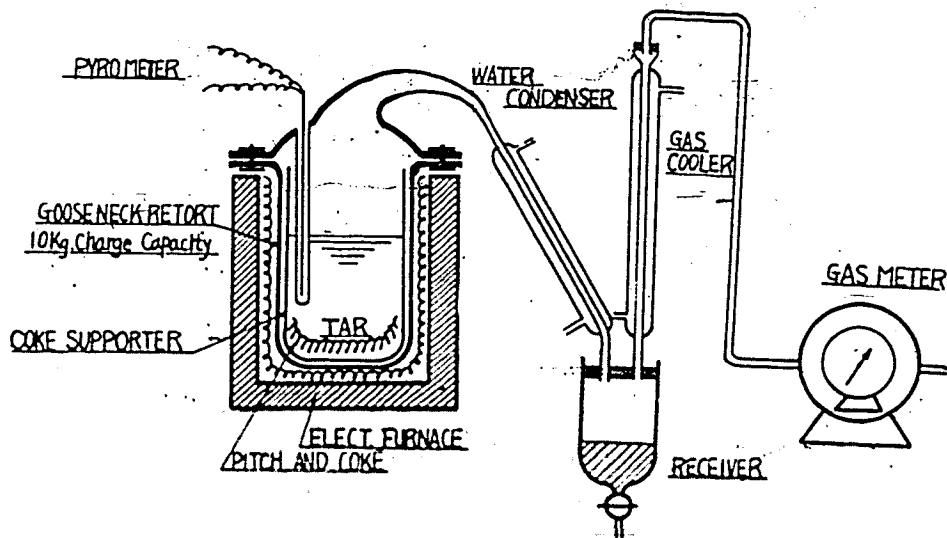


Figure 1 (B)11  
DIAGRAM OF LIGNITE OIL DISTILLATION RETORT

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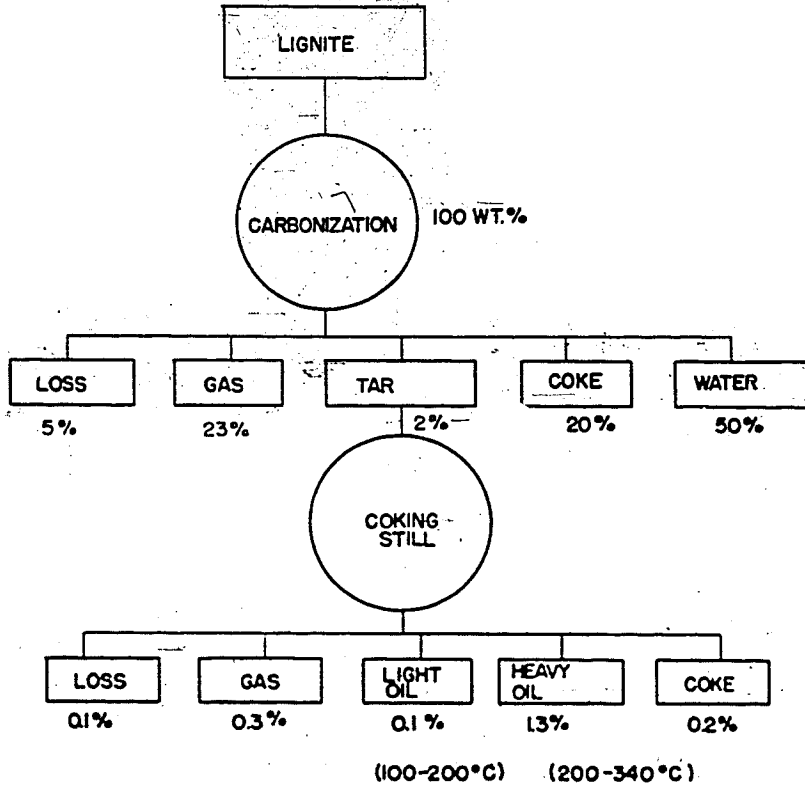


Figure 2 (B)11  
MATERIAL BALANCE